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Editors: P.B. Hallebeek, J.A. Mosk
DTP: J.A. Mosk
Word processing: S.F. Fontijn

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Conservation of a 17th- and 18th-Century Polish Gala Saddle Accessories from the Collections of the National Museum in Poznań

Dorota Jutrenka-Supryn, Halina Rosa
Nicolaus Copernicus University
Laboratory of Paper and Leather Conservation
P-Torun

The 17th and 18th century gala saddle accessories from the National Museum in Poznań, which underwent conservation work, were composed only of leather parts of the proper accessories i.e. headstall, crupper and breastplate. The reins and bridle were missing from the breastplate. The saddle was made of horse leather, painted red, sewn with silver thread and richly ornamented on the grain side with silverpieces with Niello decoration or gilded and set with precious stones.

The individual parts of the accessories were joined with large buttons and sheet metal which were silver, niello engraved, gilded and set with precious stones.

The object presented a very complex conservation problem because of the variety of materials of which it was made. Therefore it was necessary to prepare a wide range of work taking into consideration different properties of individual materials and other conservation methods to be applied. Another problem was related to the fact that some elements could not be separated.

The conservation of the saddle accessories aimed, first of all, at an improvement of its damaged condition and at stopping in process of ageing. As the object had a very significant historic importance combined with a great decorative value, a decision was taken to reconstruct the missing silver elements and precious stones. The purpose of the task was to complete the artistic outlook of the whole and to join together the elements of accessories which had been separated earlier (1).

Techniques of Execution

The main structure of the described saddle accessories is made by straps of horse leather tanned with plant substances and painted red. They are sewn on the flesh side with flaxen threads and on the grain side with silk threads on silver warp.

The joining areas of individual leather elements are decorated with silver buttons and sheet metals. The grain surface of belts is decorated with silver pieces too.

The pieces were formed into the shape of flattened rings and pulled on the straps of grease-tanned leather owing to which it was possible to attach (sew) them to the straps of the basic structure.

Silver sheets, buttons and pieces are decorated with ornaments executed in three techniques: niello and/or engraving with punching. The engraved and punched fragments were gilded. Buttons and metals as well as all the gilded pieces are additionally set with precious stones. Carnelians were used for this purpose. On four of the largest buttons and metals, tourmalines and pomegranates were applied additionally, set together, 5 or 3 in a row. A delicate, geometrical sketch was shallow-engraved and gilded in the carnelians, used to set buttons and metals as well as pieces for the crupper with precious stones.

Condition of preservation

The individual parts of the saddle accessories showed different levels of deterioration.

The headstall was relatively the most damaged and the crupper the least.

The leather parts underwent mechanical, physico-chemical and biological damages.

The leather grain was frayed in many areas so as to show its thermostatic layer. A source of mechanical deterioration was the fact that some robbers tore silver parts off the leather.

Two original silver buttons which must have existed on the connection between the nose band and the cheek straps were removed in a way which involved ‘tearing out’ of the end fragments of the nose band. The edge of the brow band was damaged too through cutting off so deep as to show the inner structure of the stitch. The physico-chemical deterioration included visible drying up of the leather which resulted in a tendency to break into pieces and powder, particularly on the flesh side.
The leather became very stiff in the areas where the saddle accessories were exposed to the sweat and foamed saliva of the horse. The incrusts on the inner side of the nose band were particularly extensive. They were also present on the flesh side of the crupper straps close to the crupper loop and on the flesh side of the cheek straps in the areas where the bridle was attached.

The microbiological deteriorations were caused by the activity of insects (a dermestid, *Attagenus piceus*). The most susceptible to their attacks were those parts of the leather which had been joined together with the use of starch glue.

Particularly extensive deterioration was ascertained in two leathers glued together, under the metal of the nose band.

It was possible to notice a relation between the level of impregnation of the leather through incrusts and the choice of feeding grounds made by the insects (they devoured impregnated areas with greater intensity).

Silver threads of the decorative sewing of straps got crushed (particularly in the head parts). As a result of this phenomenon, the uncovered silver warp was getting frayed until it got torn off and losses were incurred.

Fig. 1. *The saddle accessories before conservation, detail.*
Fig. 2. *The saddle accessories mounted, after conservation.*

The flaxen thread sewing got preserved to a large extent. It was torn off in a few areas and in very short sections. The silver parts belonging to the saddle accessories suffered, above all, mechanical damage. The pieces with the niello ornaments were more or less deformed. There were some losses in a few of them. Other deteriorations relate to the pieces set with precious stones. They were caused when removing the stones. The edges of binding were bent aside and even torn off. The stones were removed a few pieces, and also from the button on the headpiece, from the metal on the noseband and from the buttons of the alsbant. The silver parts suffered from corrosion to a small extent. Black residue of silver sulphide was found in small quantities on the parts which were punched. Green residue of basic copper carbonates \( \text{Cu(OH)}_2\text{CuCO}_3 \) and \( \text{Cu(OH)}_2\cdot2\text{CuCO}_3 \) (which were formed as a result of the corrosion of copper as part of the alloy) was found out in small quantities inside the silver pieces. This caused the fact that the residue dyed also partly straps of leather tanned with grease, on which the pieces were put. The assembly of silver decorations of the saddle accessories was not complete.
A few silver pieces were missing, just as two buttons and two buckles which served to cover the connection of the cheek straps with the nose band and to fasten the endings of the cheek straps after the snaffle had been mounted.

Conservatory work carried out

As we have already mentioned, the main goal of the conservators was to bring the object to a condition to enable it to be incorporated into the museum collection. Therefore a series of treatments was executed including the conservation of leather straps, threads and silver elements. A reconstruction of missing silver elements and precious stones was carried out. In the first phase of the work the silver parts were separated from the leather parts of the saddle accessories. However, the idea to remove the headpiece button, the ornamented endings of the alsbant and the throat lash from the straps was given up as it could endanger the leather condition.
Conservation of silver elements

The work on the conservation of silver ornaments included their cleaning, restoring the original shape to those which were deformed, and protection from corrosive activity of outside conditions. Surface dirt was cleaned off the silver parts with a soft rotary rubber. Because of the corrosion products being present, a chemical treatment of cleaning was also carried out by means of Seignette’s salt (sodium-potassium tartrate) (NaOC-CHOH-CHOH-COOK.4H2O) in sodium hydroxide solution in the lowest concentration recommended for the conservation of silver, neutralized afterwards with 3% solution of citric acid. The applied solution cleaned the surface of the silver very well, and its application enabled a better cleaning of the punched fragments and of the inside of the silver pieces. The silver elements which were connected with the leather elements were cleaned with swabs soaked alternately with salt solution and distilled water. A special attention was paid not to let the cleaning agent touch the leather. Subsequent rinsing and necessary neutralization of the salt solution were carried out in a similar way.

The deformed parts of the pieces ending the sequences were delicately hammered out with a jeweller’s hammer through a flannel, after being a little warmed up to avoid metal micro-cracks and to make it more flexible. After of these treatments, the grease was removed from the silver surface and it was covered with a protective coat, through immersing it in 10% solution of Paraloid B72, in toluene. On the elements joined to the leather, it was necessary to put the layer of Paraloid with a soft brush.

Leather cleaning

The conservatory treatment of the leather parts of the saddle accessories was carried out without unstitching the straps in order not to damage the weak silver warp of the silk threads. At first the grain and the silver threads were cleaned mechanically with soft rubbers to remove the surface dirt. Then some trials of chemical cleaning of its surface were executed by means of foam made on the premises from CANPAC soap and Marseille soap, afterwards they were washed off with a mixture of water and isopropyl alcohol (1:1). The activity of both soaps turned out to be unsufficient in case of hard incrusts, present in the leather. Their reaction was caused only after a shallow washing bath was supported by the activity of ultrasound. A medical apparatus, Ultraton, was applied with a potential for the ultrasound to act locally. After this treatment the soap was washed off the leather with a mixture of water and isopropanol in various proportions, gradually increasing the participation of alcohol to partly dehydrate the leathers. Taking profit of the wet condition of the leather, it was soaked in 7.5% potassium lactate and it was additionally tanned with a 5% water/acetone solution of sumac. After the leather had dried, it was found out that the effect of the last treatment was good. The darkening of the leather caused by the incrusts got only a little lighter, but its elasticity was restored. After the said treatments the straps were straightened under a light load. For this purpose, special cardboard shapes were prepared, and they made it possible to flatten the protruding stitch.

Filling of losses in the leather elements and repair of the straps weakened by sewing

After the cleaning and the application of buffered solution to the leather, some scales were glued in the frayed areas with Klucel glue. Tiny losses in the leather, as well as deeply frayed areas were filled with suitable cut pieces of calf skin, glued with Klucel. Large losses caused by the activity of insects, particularly in the noseband, were firstly filled with putty made from leather chips and polyvinyl acetate (PVA) and then they were covered with fragments of calf skin grain, cut to fit exactly the shape of the losses. The same skin was also applied to prolong the endings of nose band leather strap and to fill up the cut edge in the brow band-throat lash leather strap. In this case polyvinyl acetate glue was applied as it has a stronger binding force than Klucel, and the additions carried out must play a constructive role. The repair of the frayed stitches was effected on the grain side with synthetic threads of a colour fitting the silk threads, whereas on the flesh side flaxen threads were used. The repairs were carried out sewing the threads with a thin needle, putting in into the old holes, and partly gluing them in by means of 7.5% Klucel.
Extensive loss of stitches on the brow-throat leather strap were replaced on the grain side with synthetic threads, and on flesh side the preserved elements of flaxen threads were sewn in, with some new threads added.

**Leather currying**

The leather was curried on the grain side and where possible on the flesh side too, with oiling agent according to Van Soest based on bubulum oil and lanoline in isopropyl alcohol mixed with mineral spirits.

As there was no possibility to check the grease contents in the leather it was determined (based on earlier experience of the atelier) to spread the prepared solution three times with a paint brush. The oiling agent caused no colour changes in the leather.

**Colour unification of leather additions and silver threads**

Water colours were used for the purpose of colour unification of the leather surface. The grain of the skin used for additions was also suitably unified with the colour of the original skin. The punching were covered with a thin layer of retouching varnish. The added stitches had to be made look like silver. Specimens of synthetic threads were soaked in various glues which were to decrease their elasticity, fluffiness, and absorbability, whereafter it would be easier to put silver powder in 10% PVA upon them and after drying of the filler metal, to polish it. All the methods of stiffening were considered insufficient for the synthetic threads.

Good results were obtained by soaking a fragment of the original silk threads (without the silver, which was not preserved) in 10% Paraloid B72. Leather thread soaking in the solution of this resin was also advantageous for another reason; it protected the preserved silver warp against corrosion processes. Afterwards silver powder in PVA was spread with a thin paint brush, trying to cover with it each thread separately. After the binding agent had dried, the silver plating was polished and protected with a thin layer of retouching varnish.

The idea of silver plating was given up for the synthetic threads. Instead they were colour unified with the whole of sewing, through stitching to them or partly gluing polyethylene silver threads. The latter had the same thickness as the original silver silk threads and their shade was only a little lighter. Their application made it possible to gain a skew effect, a decoration system of sewing in the large losses. These threads were also protected with Paraloid B72.

**Waxing of leather**

The last treatment consisted in covering the leather grain with 10% solution of bees-wax in mineral spirits. The wax was applied on swabs, avoiding touching the threads. 24 hours later the straps were polished with a soft rag until a uniform, delicate gloss was achieved.

**Making copies of missing silver elements and precious stones**

As the saddle accessories were designated to be exposed, it was decided to make copies of the missing silver elements and precious stones. This decision was not only made in order to restore the full artistic value of the whole set, but it also resulted from the need to connect the parts of the head straps which had been separated. Before taking up the decision on reconstruction, all the silver pieces were thoroughly examined to ascertain how many of which elements were missing. Particular attention was paid to the manner the brow band was connected to the cheek ones.

An analyses of the construction of other saddle accessories of this historical period (Military Museum in Warsaw, Wawel Castle Museum in Krakow. The Czartoryskis’ Museum in Kraków, the Castle Museum in Malbork) showed that the elements which were situated on the crossing of the cheek bands with the nose and brow bands were repeated several times in each of them. During reconstruction, endeavours were undertaken to use the material and techniques as close to the original as possible. Copying of the niello ornament became a problem. This technique of metal ornamenting is no more applied as it requires an additional equipment for the goldsmith's atelier and high artisanal qualifications. The costs of re-making turned out to be very high too.
Therefore it was determined that the ornament would be performed in ZKPiS (Polish abbreviation for Atelier of Paper and Leather 1k Conservation at the University of Toruń) in a technique similar to the niello decoration. Forging of the basic shape of silver ornaments together with the execution of engraved ornament, carving and gilding was commissioned with M. Milanowski, an artist from Gdańsk. For the imitation of the niello technique at first suitably formed silver pieces were covered with black varnish. When its coat hardened, a negative sketch was executed, uncovering the lines which were to be subjected to etching afterwards by means of a specially prepared scalpel. The pieces were immersed in 50% HNO3 and the process of etching was under control. After the sketch was etched the pieces were rinsed in running water to stop the activity of the acid, whereafter the varnish was removed through baths in mineral spirits.

Pigment in acrylic binding medium was introduced in the concave relief. In the end, the surface of the pieces was polished whereby the surplus of the pigment was removed. The side surface of the pieces were gilded with an imitation of flake gold, put of on gold size and protected with Paraloid B72 too. In the first trials to reconstruct the precious stones a chemico-hardened epoxy resin Epidian 5 with hardening agent Tecza Zi and suitable pigments were used. For this purpose a caoutchouc negative mould of the polished section of the preserved stones was made. The resin was poured into this mould in two layers. The first one contained less pigment and was to stay half transparent, the other one had more pigment and had a decisive effect on the final colour of the imitation. After the resin hardened, the effects were verified. Epidian 5 imitated the shape of the stones polished section very well. The trial to get the depth of a mineral was positive too. The fault of the imitation was the fact that high glitter of carnelian was missing. A coating of Paraloid B72 increased the glitter a little, but ‘made more even’ the sharp edges of the polished section. The trials to make the imitation were considered successful, but only the stones repeated in the saddle accessories could be restored in this manner (because of the need to execute a caoutchouc negative mould firstly). However, the reconstruction of the largest missing stones was necessary to restore the full artistic value. The reconstruction of the stones was commissioned with ‘Corundum’ Atelier of Jeweller’s Stones Polishing Magdalena Korpańska & Piotr Bloński (Wroclaw). The employees of this atelier undertook the task of polishing and fitting to the mounting the missing stones with reconstructed, irregular 17th century polished sections. Therefore before the reconstruction was started, a few trial polished sections had been developed. The experimental polished sections imitated the original treatment of the stones faithfully. It is worth mentioning that it was decided to use the materials which had been primarily applied to ornament the ancient saddle accessories for the reconstruction. It turned out not to increase the costs and it significantly emphasized the artistic value of the object.

The engraving on the stones was carried out in ZKPiS. Before the work was started a few trials of engraving had been carried out on a lump of mineral (carnelian) with one face polished. Firstly, the stone was covered with a layer of white ink. Upon it the sketch was drawn in pencil, and afterwards it was engraved with a diamond ending, fixed onto a high rotation grinder (Poxon). Then the white ink was washed off, and where needed, the relief was deepened. The concave sketch, prepared thus was filled with gold size by means of a thin paint brush and 8 hours later it was covered with gold powder. The experimental engraving and gilding was very successful and the polished stones were treated in the same way.

After the described treatments and the copied elements had been completed the object was assembled. The silver elements were joined to the leather elements according to the condition before the conservation.

Notes
1. The conservation of the saddle accessories was carried out in the ZKPiS - The Atelier of Paper and Leather Conservation at the University of Toruń, as a final thesis with the assistance of Dr Halina Rosa

2. Information obtained by consulting Prof. Z. Zygulski and A.R. Chodyński.